Chapter 5

Exocentric Sensing & Delivery:

Facial Expressions

As described in Chapter 2, in the survey conducted towards understanding the non-verbal cue needs for people who are blind and visually impaired, they emphasized on the lack of access to facial expressions and mannerisms of their interaction partners. This is supported by the argument that most part of the non-verbal cues occur through visual facial mannerisms as described in Section 1.2.1 of Chapter 1. The face encodes a lot of information that is both communicative and expressive in nature. Unfortunately, the face is a very complex data generator and the encodings on the face are not very context sensitive and individualistic in nature. Evolving computing technologies have been focused on developing solutions towards understanding the nature of facial mannerisms and gestures, but most of this multi-modal affective interaction research has been focused on the development of sensors and algorithms that understand user's emotional state in a human-machine interaction scenario. These interactions are mostly unilateral in nature and directed primarily towards the machine interpreting the user's emotional state. That is, the machines become the primary consumers of the affective cues. But from the perspective of an assistive technology affect interactions have to be augmentations that enrich human-human interpersonal interaction, where the machines not only interpret communicator’s affective state, but also delivers affect information through novel affect actuators to a social interaction recipient.

As mentioned before most affect information is causal in nature and understanding what the expression or mannerism means requires an understanding of context when it is happening and the situation in which the communication is occurring. Our understanding of the cognitive models within the human brain that allows for the processing of complex facial expressions and emotions is very naïve. Computational models developed towards understanding context are very simplistic and performs nominally even under very well controlled laboratory conditions. Contrary to such a setting, assistive technologies provide some respite to the complexities by having the cognitive abilities of the user of the technology to make decisions. That is, while human computer interfaces need to mimic sensing, cognition and delivery, assistive technologies for people who are blind have to look at sensing and delivery alone and piggy back on human cognition. This requires precise sensing of the facial and head movements while delivering as much information back to the user as possible through technologies that do not overload the user with information but provides just the right level of information to allow them to cognitively process this information.

Thus, the focus of this chapter is on the *precise sensing* and *proficient delivery* of facial mannerisms and gestures of interaction partners to the user of the Social Interaction Assistant who is blind or visually impaired. To this end, the two important aspects of sense and delivery will be handled simultaneously to meet the goal of delivering dynamic facial and head movement information to the user of the social interaction assistant.

*From the sensing perspective, current ongoing experiments in tracking of facial expressions and mannerisms will be described in detail with identified areas that need special attention.*

*From the delivery perspective, the latest in haptic interface will be introduced as a means of conveying facial and head mannerisms. Details on the experiments that have been carried out and the ones that needs to be conducted will be illustrated.*

# Sensing Facial Mannerisms and Expressions:

## Head Movements:

## Facial Feature Movements:

## Experiments:

# Delivering Facial Mannerisms and Expressions:

## Platform for delivering high bandwidth data:

## Experiments: